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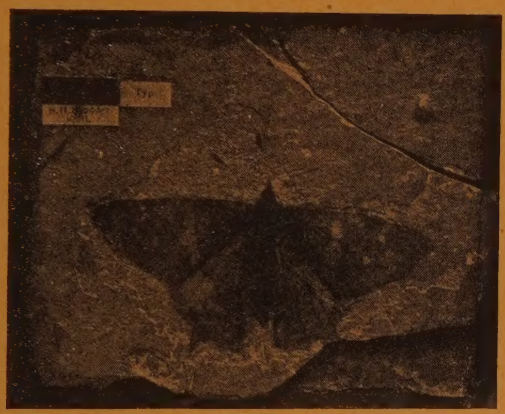

Prodryas persephone Scudder.

CONTENTS.

The Habit of Leaf-Oviposition Among the Parasitic Hymenoptera. *H. S. Smith* . . 63

Key to the Species of Leptoglossus Guér. Occurring North of Mexico (Heteroptera: Coreidæ). *E. H. Gibson* 69

The Life-History of *Mesovelia mulsanti* White. *H. B. Hungerford* 73

Notes on Aphids. *G. O. Shinji* 84

An Interesting Manuscript. *L. O. Howard* 87

The North American Species of Pachyneuron with Three New Species (Chalcid-Flies). *A. A. Girault* 88

New Miscellaneous Chalcid-Flies from North America. *A. A. Girault* 91

A New Species of the Genus Mymar from the Woods of Maryland with an Important Descriptive Note. *A. A. Girault* 99

A Metallic Species of Cirrospilopsis from Maryland (Hymenoptera: Eulophidæ). *A. A. Girault* 100

A New Species of Closterocerus from California (Hymenoptera: Eulophidæ.) *A. A. Girault* 101

A New Genus or Subgenus of Pachyneurine Chalcid-Flies. *A. A. Girault* 102

Exchange Column 103

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PSYCHE

VOL. XXIV JUNE, 1917 No. 3

THE HABIT OF LEAF-OVIPOSITION AMONG THE PARASITIC HYMENOPTERA.[1]

By Harry Scott Smith.

Entomologists have for some time been more or less familiar with the strange habit of leaf-oviposition in the parasitic dipterous family Tachinidæ. Twenty-nine years ago Dr. C. Sasaki of the Imperial University of Japan[2] made the interesting discovery that the so-called Ugi parasite of the silkworm (*Crossocosmia sericariæ* Corm.) deposits its eggs not within or upon its host, as was the habit of all other known parasites, but upon the leaves of the food plant of its host, *i. e.*, the mulberry tree. These eggs were minute and very numerous and were taken into the alimentary canal of the silkworm along with the mulberry leaves upon which it fed. Later, in 1908, Mr. O. H. Swezey[3] found the same curious habit to occur in the life-history of the Tachinid *Chætogædia monticola* Bigot, a parasite of various lepidopterous insects in the Hawaiian Islands. During the same year Mr. C. H. T. Townsend[4] of the U. S. Bureau of Entomology recorded this curious habit in the Tachinid *Blepharipa scutellata* R. D., introduced into New England from Europe as an aid to the suppression of the Gypsy Moth, and in *Pales pavida* Meigen, introduced for the same purpose. Mr. Townsend also mentioned several other species which he suspected to have the leaf-oviposition habit. Another curious deviation from the regular methods of reproduction Mr. Townsend found to occur in *Eupeleteria magnicornis* Zetterstedt, and *Zygobothria nidicola* Townsend, these flies depositing living maggots on the leaves upon

[1] Occasional Contributions from the Cal. State Insectary, No. 5.

[2] Sasaki, C., On the Life-history of *Ugimya sericaria* Rondani. Journ. Coll. Sci. Imp. Univ. Japan, Vol. I, pp. 1–39, 1887.

[3] Swezey, O. H., Observations of the Life-history of *Chætogædia monticola* Bigot. Proc. Hawaiian Ent. Soc., II, pp. 1–35, 1908.

[4] Townsend, C. H. T., A Record of Results from Rearings and Dissections of Tachinidæ. Bull. U. S. Dept. Agric., Bur. Ent., Tech. Ser., No. 12, pp. 93–118, 1908.

which the host feeds. The maggots attach themselves to the caterpillar host as it crawls over the food plant, and later bore their way into its interior. Recently Mr. J. L. King, of the Ohio Experiment Station, has given us an extremely interesting account of the same general habit, the subject of his studies being the Cyrtid *Pterodontia flavipes* Gray, a parasite of spiders.[1] Up to the present time, however, no such startling deviation from the normal has been observed in the parasitic Hymenoptera.

In 1909 and 1910 the writer, while engaged in the study of the hymenopterous parasites of the Gipsy and Browntail Moths at the laboratory of the U. S. Bureau of Entomology, Melrose Highlands, Mass., carried on an investigation of the life-history and habits of *Perilampus hyalinus*, a hyperparasite of the Fall Webworm. In brief the life-history of this chalcidoid parasite was found to be as follows: Nothing in regard to the egg-laying habits could be ascertained. The first stage larva, however, a very curious being, heavily armored with chitinous plates and provided with numerous curved hooks and spines, was found crawling about on the outside of the caterpillar. Later these first stage larvæ or planidia were found to bore their way into the body cavity of the caterpillar, there swimming about freely until the primary parasite larva, either hymenopterous or dipterous, was found, and into which they gained entrance. The Perilampus larva then remained quiescent until the primary parasite became full-fed and made its exit from the caterpillar to spin its cocoon or form its puparium. At the time of ecdysis the planidium found its way to the exterior of the host, after which it fed as an ectophagous parasite in the normal way. The egg-laying habit of this strange parasite has, however, remained a puzzle to entomologists, and at that time the writer made the following statement in regard to it:[2]

"There have been made, so far as published records go, at any rate, no observations upon the oviposition of members of the genus *Perilampus*. It is known, however, that oviposition does not occur in the normal way, or in the manner we are accustomed to regard as the normal method of oviposition among the parasitic Hymen-

[1] King, J. L., Observations on the Life-history of *Pterodontia flavipes* Gray (Diptera). Annals Ent. Soc. Am., Vol. IX, p. 309–321 (1916).

[2] Smith, Harry S., The Chalcidoid Genus Perilampus, and its Relation to the Problem of Parasite Introduction. Bull. U. S. Dept. Agric., Bur. Ent. Tech. Ser., No. 19, pp. 33–69, 1912.

optera, and for this reason speculations on what may actually occur are rather interesting.

"In the first place it is obvious from the facts recorded in the preceding pages that *Perilampus* does not oviposit directly in or upon its host. In the second place, it does not oviposit within the caterpillar of which its host is a primary parasite, which is equally obvious from the observations already made. That it places its eggs *upon* the young caterpillar is improbable, the adult *Perilampus* being too slow and clumsy to be capable of accomplishing this act with any degree of certainty.

"There are two plausible methods which *Perilampus* might adopt for the deposition of its eggs, and the writer is strongly inclined to the view that one of these methods is in part at least correct. As in the case of some of the parasitic beetles, it may deposit its eggs upon flower heads or upon leaves of plants not in the immediate vicinity of the caterpillar colony, the planidia hatching from these eggs being conveyed to the caterpillars by means of some intermediate carrier. In the Coleoptera cited above the carrier is frequently a parasitic bee upon which, by means of their claws, the triungulins attach themselves and are conveyed to the nest of their host. With *Perilampus*, should this method prove to be the one which really takes place, the intermediate carrier might be any of the primary parasites which attack *Hyphantria;* that is, the hymenopterous parasites *Limnerium* or *Apanteles*, or the Tachinid *Varichæta*. The planidium seems more or less fitted for this sort of a life and is apparently analogous to the triungulin of the coleopterous parasites. The chitinous plates with which it is armored are especially serviceable in preventing injury of various kinds, and the mandibles and hooks and spines would serve it very well as a means of clinging to its conveyer. . . .

"The other method, which seems much more plausible, is that of oviposition upon the food plant *in the vicinity of a colony* of the caterpillars. This would do away with the necessity of an intermediate carrier, but would expose the delicate eggs to great danger unless they hatched immediately after deposition. . . .

"While the eggs of *Perilampus* have not been observed after deposition, those contained in the ovarian tubes, in one case ap-

parently mature, have been examined. They are of the usual elongate-oval shape, not stalked, and whitish in color."

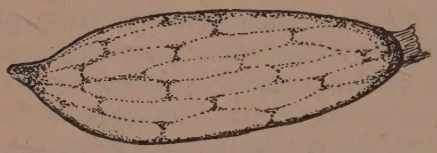


Fig. 1. Egg of *Perilampus chrysopæ* var., greatly enlarged. (Original.)

For seven years the writer has been looking for a chance to corroborate or disprove the theories advanced in the above statement, but the opportunity did not present itself until about two weeks ago. During the previous summer specimens of *Perilampus* were occasionally bred from *Chrysopa* cocoons. Recently the writer was successful in capturing several adult female *Perilampus*[1] of this species hovering about oleanders infested with *Aphis nerii* and fed upon by *Chrysopa*. The insects were then watched and were observed frequently to touch the tip of the abdomen to the leaf. On placing the leaf under the binocular microscope the minute transparent eggs of the *Perilampus* were seen, one end of the egg being slightly attached to the leaf. This observation proved the correctness of the original theory and established beyond doubt the habit of leaf-oviposition among the parasitic Hymenoptera. The eggs are numerous, one female depositing fifty-two in a single day. They are pearly white in color, about twenty-five one-hundredths millimeter in length, and are characteristically sculptured. The egg is very faintly attached to the

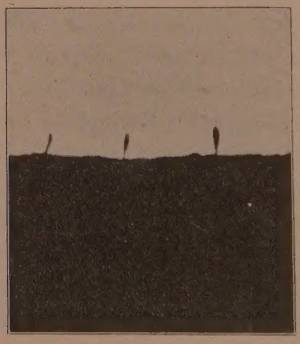


Fig. 2. Planidia of *Perilampus chrysopæ* var., attached to edge of oleander leaf and awaiting the approach of Chrysopa larva. (Original, photographed from life.)

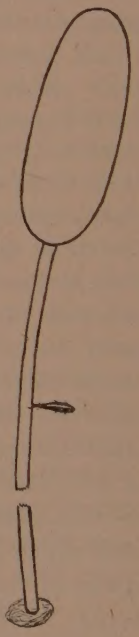


Fig. 3. Planidium of Perilampusattached to egg-stalk of Chrysopa. (Original.)

[1] Determined by J. C. Crawford as *Perilampus chrysopæ* Crawford, new variety.

surface of the leaf at one end. Hatching takes place in seven to ten days and the first stage larva is of the planidium type described in the above mentioned paper. For several days previous to hatching the dark-colored planidium can be plainly discerned through the transparent egg-shell. The planidium is active immediately upon hatching, crawling rapidly about, but soon it attaches itself to the leaf by means of the caudal sucker and stands out at right angles to the surface. In this position it remains for days at a time, motionless, excepting when some insect comes within its reach, when it suddenly becomes frantically active, reaching and swaying back and forth in its attempt to attach itself to the prospective host. If the latter should unfortunately come too near, the planidium attaches itself with lightening-like quickness to a hair or bristle of the host. It then leisurely crawls down the hair to the host's body and attaches itself by its mouth-hooks. Quite often the planidia are found attached to the egg-stalk of *Chrysopa*, assuming a position at right angles to the axis of the stalk. This shows an interesting instinct in the planidium, since it may and actually does, as the writer has observed, waylay the young Chrysopa larva as it leaves the egg and crawls down the stalk. The prescience of the mother Chrysopa in placing her eggs at the end of a long egg-stalk to overcome the cannibalistic propensities of her progeny is in this case their undoing, since the planidium attached to the Chrysopa egg-stalk is sure to reach its proper host, while those upon the surface of a leaf are quite as likely to attach themselves to an aphid or other insect.[1]

The planidia are remarkably long-lived for such delicate creatures. I have had them live for a period of seventeen days without food of any kind and without changing their position. Those which are fortunate enough to become attached to a Chrysopa larva immediately, as mentioned above, crawl down the hair or bristle and by means of their mouthparts attach themselves to the skin of their host. Many of these planidia undoubtedly lose their opportunity to develop through the moulting of the Chrysopa larva, although sometimes, as observed by the writer in the laboratory, they succeed in changing their position from the

[1] In a note in the Journal of Economic Entomology, Vol. 9, p. 510, Mr. M. T. Smulyan mentions having found a Perilampus planidium on an aphid. Without doubt this is the young of a Chrysopa infesting species which attached itself to the wrong host. They will even grasp a camels hair brush if brought within their reach.

moult-skin to the newly moulted host. In cases where the Chrysopa larva died in the laboratory, the planidium invariably crawled out on the end of a hair, attached itself by the caudal sucker and awaited the approach of a new host. Apparently the planidium takes no nourishment until the Chrysopa larva spins its cocoon and pupates, after which it begins to feed and develops in much the same way as the writer has described for *P. hyalinus* (*loc. cit.*), excepting that it is never an internal parasite so far as has been observed.

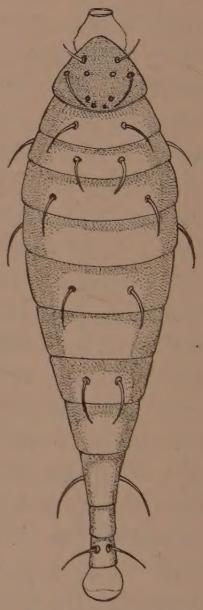


Fig. 4.—Planidium of *Perilampus chrysopæ* var., greatly enlarged. Dorsal view. (Original.)

It is difficult to understand just what is gained, from the standpoint of *Perilampus* infesting *Chrysopa*, by this extraordinary habit, since the Chrysopa larva is easily accessible to the normal method of oviposition and is in fact parasitized in the larval state by a number of parasites which oviposit directly into the host. In the case of *Perilampus hyalinus*, however, and other species having similar habits, the advantage is obvious, since by no other method could access be had to the larvæ of the primary parasites. In the case, too, of those species of Perilampus infesting wood-boring Coleoptera and gall-making and stem-infesting Lepidoptera (the correctness of which records the writer is frank to confess he previously looked upon with doubt), the usefulness of this method of oviposition taken with the active planidium stage is readily seen, since in this way access is easily gained to the endophagous host through the wanderings of the planidium. Needless to say, this type of reproduction forms one of the most extraordinary adaptations to environment in the entire field of entomology.

KEY TO THE SPECIES OF LEPTOGLOSSUS GUÉR. OCCURRING NORTH OF MEXICO (HETEROPTERA; COREIDÆ).

By Edmund H. Gibson,
Bureau of Entomology, Washington, D. C.

The cosmopolitan genus Leptoglossus Guér. is represented in America, north of Mexico, by nine species all of which are listed in Van Duzee's recent check list. Specimens bearing labels of two other species, namely *balteatus* Linn. and *stigma* var. *minor* Dall. are in the collection of the U. S. National Museum, but I believe them to have been wrongly determined.

This genus belongs to the tribe Anisoscelini A. & S. and may be separated from Chondrocera Lap. and Narnia Stal, the other two genera of the tribe which are known to occur in North America, by the large dilations of the hind tibiæ and simple antennæ which have their basal joint long.

In working out the key to the species, color markings have been eliminated as far as possible. Specimens of each species have been examined and in practically each one access has been had to large series, which are in the collection of the U. S. National Museum.

Leptoglossus Guér.

Leptoglossus Guér., Voy. de la Coquille, Ins., p. 174, 1838.

Anisoscelis Spin., Ess. Hem., p. 200, 1837.

Theognis Stal, Stettiner, Ent. Zeitg., xxiii, p. 294, 1862.

Leptoglossus Guér. may be characterized as follows: Head elongate, horizontal. Antennæ rather stout but not swollen or dilated, basal joint long, about equal to length of the head; rostrum passing the metasternum; bucculæ short. Thorax longer than head, broad and rounding posteriorly. Elytra narrowing towards apex. Hind femora more or less swollen; hind tibiæ with large dilations of foliations, the outer margins of which are usually more or less deeply scalloped. Spiracles at base and apex of abdomen about equally remote.

The haplotype of the genus is *dilaticollis* Guér.

Key to the species of Leptoglossus occurring north of Mexico.

1. Thorax coarsely punctate or rugose . . . . . *fulvicornis* Westw.
   Thorax not rugose, only finely punctate 2
2. Apex of head terminating in a stout spine . . . . . *clypealis* Heid.
   Apex of head without a spine 3
3. Fourth joint of the antennæ equal to or shorter than the third joint 4
   Fourth joint of antennæ longer than third joint 5
4. The outer expansion of the hind tibiæ reaching almost to apex of tibiæ, lanceolate . . . . . *corculus* Say
   The outer expansion of the hind tibiæ reaching but two thirds the length of tibiæ, foliaceous . . . . . *occidentalis* Heid.
5. Lateral-posterior margins of thorax more or less crenulate 6
   Lateral-posterior margins of thorax not crenulate, and with only a mere trace of a transverse color band or line on the elytra . . . . . *oppositus* Say
6. Posterior angle of thorax terminating in a prominent spine *gonagra* Fabr.
   Posterior angles of thorax not terminating in a prominent spine 7
7. Thorax bordered with bright orange and foliation of hind tibiæ short . . . . . *ashmeadi* Heid
   Thorax not bordered with orange. Foliation of hind tibiæ large and long 8
8. Scallops in the foliations of the hind tibiæ deep and long. Posterior femora prominently incrassated . . . . . *zonatus* Dall.
   Scallops in the foliation of hind tibiæ shallow and usually short. Posterior femora swollen but not prominently incrassated *phyllopus* Linn.

Leptoglossus fulvicornis Westw.

Leptoglossus fulvicornis Westw., Hope Cat., 11, p. 17, 1842.

Leptoglossus magnoliæ Heid., Pro. Ent. Soc. Washington, xii, 1910, p. 191.

This is a large species and can be distinguished from all others by having the thorax coarsely punctate or rugose. Antennæ and first two pairs of legs light in color. No band or markings on elytra. Posterior angles of thorax broadly rounded and prominently raised.

It ranges from Maryland southward through Florida and Alabama.

Leptoglossus clypealis Heid.

Leptoglossus clypealis Heid., Pro. Ent. Soc. Washington, xii, p. 195, 1910.

The apex of the head terminating in a spine is the character which readily distinguishes this species from all others of the genus.

This is a western species occurring from Nebraska to Oregon, south through California, Arizona and New Mexico.

Leptoglossus corculus Say.

Anisoscelis corculus Say, Ent. of N. A., Vol. 1, p. 326, 1832.

Theognis excellens Mayr, Verh. Zoöl.-bot. Ges. Wein., xv, p. 434, 1865.

Together with the following species corculus has the fourth joint of the antennæ equal to or shorter than the third. This character may be used to separate these two species. *Corculus* differs markedly from occidentalis in having the dilation of the hind tibiæ lanceolate and reaching nearly to the apex of the tibiæ, while the dilation in occidentalis is foliaceous and much shorter.

It is known to occur from New Jersey southward through Georgia, and west to Colorado.

Leptoglossus occidentalis Heid.

Leptoglossus occidentalis Heid., Pro. Ent. Soc. Washington, xii, p. 196, 1910.

Following his description of the species Mr. Heidemann states: "This species has frequently been determined as *L. corculus* Say—but by close observation the differently shaped expansion of the hind tibiæ will distinguish it at once." The expansion is shorter and foliaceous.

The known distribution is from Colorado west to the coast and from California north to Vancouver.

Leptoglossus oppositus Say.

Anisoscelis oppositus Say, Ent. of N. A., Vol. 1, p. 326, 1832.

Anisoscelis tibialis H. S., Wanz. Ins., Vol. 7, p. 12, 1844.

The distinguishing characters for this species are the smooth lateral-posterior margins of the thorax and the unmarked elytra.

Only occasionally is there a faint transverse line on the elytra. The foliations of the hind tibiæ are large with deep scallops.

This is probably the most common species in the United States. It is primarily a southern species but is known to occur as far north as New Jersey.

Leptoglossus gonagra Fabr.

Cimex gonagra Fabr., Syst. Ent., p. 708, 1775.

Cimex grallator Herbst., Gem. Naturg., vi, p. 239, 1784.

Anisoscelis antica H. S., Wanz. Ins., iii, p. 92, 1835.

Anisoscelis præcipua Walk., Cat. Hem. Het. British Mus., p. 128, iv, 1871.

This is a large species and easily recognizable by the broad thorax, the lateral-posterior angles of which terminate in a prominent spine, and also by the yellow transverse curved line on the anterior portion of the thorax. It is strictly a southern species.

Leptoglossus ashmeadi Heid.

Leptoglossus ashmeadi Heid., Bul. Buffalo Soc. Nat. Sci., ix, p. 237, 1909.

Of the species occurring north of Mexico this is the most easily recognized one. The exceptionally short foliation of the hind tibiæ and the bright orange coloration on the head and thorax make the identity unmistakable. Mr. Heidemann recorded it only from Florida.

Leptoglossus zonatus Dall.

Anisoscelis zonatus Dallas, List. Hem. Brit. Mus., ii, 1852.

Closely related to *phyllopus* Linn. but from which it can be separated by having the scallops of the foliations of the hind tibiæ deeper and longer. A comparatively large species and recorded only from the south.

Leptoglossus phyllopus Linn.

Cimex phyllopus Linn., Syst. Nat., 1, 2, p. 731, 1767.

Anisoscelis albicinctus Say, Ent. of N. A., Vol. 1, p. 326, 1832.

Anisoscelis fraternus Westw., Hope Cat., ii, p. 16, 1842.

Anisoscelis confusus Dallas, List Hem. British Mus., ii, p. 453, 1852.

With *oppositus* Say this is one of the two most common species in the United States. It can be distinguished, however, from

oppositus by having the lateral-posterior margins of the thorax crenulated and by the prominent yellow band across the elytra. In general form it is nearest to *zonatus* Dall. but the latter has a much larger hind femora while the femora of phyllopus is only normally swollen. The scallops in the foliation of the hind tibiæ are rather shallow and much shorter than in *zonatus*. Specimens have been examined from Virginia south to Florida and Texas.

THE LIFE-HISTORY OF *MESOVELIA MULSANTI* WHITE.

By H. B. Hungerford,
Cornell University, Ithaca, N. Y.

Among the most familiar inhabitants upon the surface of our ponds and quiet pools are the "skaters." These long-legged creatures that deport themselves with such ease and agility upon the surface of the waters have been noted by even the most casual observers. Their size and movements have forced at least a passing notice, but there are a number of small related species that escape all but those who look intently. Among these smaller forms is the little green *Mesovelia mulsanti*. It wears the brightest livery of them all, for the young and the apterous forms of the adults display varying degrees of green coloration, while the winged ones are even more conspicuous on the floating blankets of green algæ because of the silvery whiteness of their wings.

These insects measure only from four to five millimeters in length but are so distinct from other bugs in structure that they have been regarded as a distinct family.

At various times in the past they have been found in our collections associated with the *Hebridæ*, *Gerridæ*, *Hydrometridæ* and *Veliidæ* but at last have been segregated as the family *Mesoveliidæ*. The species here treated is the only one reported from the United States, but it is a widely distributed form.

It is at home in the haunts of the marsh-treader on the floating vegetation growing in the shallow waters of the pools, where the clumps of sedge spread their slender stems upon the water from the bordering bank, where young cat-tails spring up and green algæ carpet the surface of the waters.

Since they were first made known to science in 1852 by Mulsant and Rey, through the description of *Mesovelia furcata*, there has been added one other species, described by F. B. White (9)[1] from the Hemiptera collected in the Amazons by Prof. J. W. Trail and named *Mesovelia mulsanti*.

The information concerning the biology of these forms is meager and confined to a paper by Butler (2), 1893, on the "Habits of *Mesovelia furcata*," collecting notes on *M. furcata* by J. Scott (6) in England, and on *M. mulsanti* by Uhler (8) and by Bueno (1) in this country. It seems, therefore, worth while to present some notes concerning the biology of *Mesovelia mulsanti* whose habits and life-history are certainly among the most interesting of all the bugs that walk upon the surface of the inland waters.

They may be separated from the other bugs of the surface film by the following synoptic table prepared by Mr. H. M. Parshley:

A. Head as long as entire thorax; body and appendages extremely slender.....*Hydrometridæ*

AA. Head shorter than thorax; form stout or moderately elongate.

B. Claws inserted at apex of last tarsal segment.

C. Antennæ 5-segmented (except in *Merragata*); clavus membranous; membrane without veins.....*Hebridæ*

CC. Antennæ 4-segmented.

D. Membrane without veins; hind coxæ rotatory; color greenish; wingless form common *Mesoveliidæ*

DD. Membrane with distinct veins forming elongate cells; hind coxæ hinged; color not greenish; wings more or less developed.....*Saldidæ*

BB. Claws inserted before apex of last tarsal segment.

C. Hind femora not extending much beyond apex of abdomen; middle pair of legs about equidistant from front and hind pairs (except in *Rhagovelia*) size usually minute.....*Veliidæ*

CC. Hind femora extending much beyond apex of abdomen; middle and hind pairs of legs approximated, very distant from front pair; size moderate, rarely minute.....*Gerridæ*

[1] See Bibliography.

Habitat and Food Habits.

It has been indicated above that these little bugs live upon the floating vegetation of ponds. Butler (2) found them on Potamogeton and Bueno (1) on duck weed, matted Hydrodictyon or other algæ. The writer has found them about old logs projecting from the water—clumps of smartweed at the water's edge as well as on rafts of filamentous algæ and leaves and stems of plants procumbent upon the surface.

They were noted by Butler to be carnivorous in tastes. He fed them a variety of small insects and saw them feeding upon a springtail, (Smynthurus), a Crambus, a Chalcid and a Hydrometra and supposed the usual food to be small Diptera and Hymenoptera. As to whether they caught their prey alive or availed themselves of the drowned and disabled specimens he was unable to say. That *M. mulsanti* can live upon such fare is certain for the writer has reared them on flies and plant lice cast upon the water.

They are cautious creatures but do on occasion fall upon fairly lively prey, as evidenced by the following instance: A fly thrown into the aquarium was seen to crawl up the side of the jar bearing an adult female *Mesovelia* with its beak attached near the caudal end of the fly which when disturbed flew to a nearby support bearing the tenacious little bug.

However, the writer has come to believe that, with Hydrometra, Microvelia and Rheumatobates, they are not dependent upon the chance and uncertain fare of terrestial insects caught upon the surface film but find another, and indeed a more constant source in the organisms that dwell below but come up to the surface film. Among these, Ostracods and like forms are available as more or less staple food and Mesovelia have been observed exploring the sides of floating Typha and the tangled mats of algæ for such Crustacea which they spear from the surface of the water.

The tiny nymphs feed upon more gentle organisms in the water, as there are few upon the surface that they are able to overcome. When offered springtails as suggested by Butler, disaster often followed and the writer lost many good rearings before he learned the inadvisability of offering such food. The hungry little creatures would attack them only to be turned topsy-turvy upon the water even by comparatively small springtails. Plant lice afforded

less risk of this kind and gave better results. They were used as the food supply in the isolation rearings where a study of molts was made. But in an aquarium twelve inches in diameter, the water of which contained algæ and floating sedge stems amongst which dwelt an abundant population of entomostracans, the little bugs were reared through their complete cycle without other resource than that afforded by the waters and the weaker of their own kind.

Life-History.

Technique in Rearing.

Butler states that "pairing took place several times and the bodies of the females became, by the end of three weeks, greatly distended." The specimens died, however, without ovipositing and his conclusion in regard to the matter, in the light of our present knowledge, seems amusing. It is only fair, however, to state that the writer had the same experience until he discovered that the female possesses an ovipositor for inserting her eggs into the tissues of plants. The newly hatched young were isolated in small stender dishes upon a very shallow film of water with a small bit of sedge stem for a support. The water was kept fresh and clean for the health of the bug and to facilitate finding the molt skins.

Oviposition.

Since Mesovelia hides and protects its eggs by burying them in the tissues of certain plants that are associated with shores and shallow waters the female possesses an ovipositor adapted to this purpose. If the female be examined in lateral view the abdomen is seen to be laterally compressed at its caudal end in such a manner as to provide a sheath or groove for the ovipositor (Pl. I, Fig. 13). A dissecting needle inserted near the distal and caudal end of this fissure can be used to pry out and bring to view a shiny brown chitinized organ which may be turned down into a position approximately at right angles to the body, for its attachment is at the basal end of the sheath. In this position it is seen to be curved so that the tip is directed slightly forward. The general shape, viewed from the front, is roughly spear shaped and the parts

arranged in such a way that the front surface is concave forming a wide groove, reminding one, when in action, of the tip of an apple corer. Upon dissection it is seen to be made up of three parts, two lateral shafts that are strongly chitinized and toothed or serrated along the lower portion of their lateral margins and a broader central plate (see Pl. I, Figs. 14 and 15). The lateral shafts are attached to the flat plates of the abdominal wall. The central portion is in reality made up of paired parts attached to the median pair of sclerites that serve as the valves or shields for the ovipositor.

The manipulation of this instrument during oviposition may be observed any time during the spring, summer or autumn by confining a number of mating insects in a petrie dish containing only clear water and some food. After being thus deprived for a couple of days of materials in which to place their eggs they will gather about a small bit of sedge stem or cat tail leaf supplied them, and most eagerly set about the business of laying eggs. The writer has seen as many as eight thus employed about a portion of sedge stem one and one-half inches long and has had ample opportunity to watch the process under the binocular.

The female frequently explores the stem with the tips of her beak and antennæ if indifferent in the matter, but if eager to oviposit, she mounts the stem without delay, raises the abdomen slightly, unsheaths the ovipositor and turns its tip down to the surface of the stem. At times the surface is tested out at several points—again if the first point of contact is favorable, the tip is caused to quiver back and forth till it gains a footing, and then rocking the body slightly from side to side the entire drill is caused to rotate or twist back and forth on its axis—rapidly at times, or again more slowly as may suit the necessity of the work, until a hole is effected and the ovipositor is buried to its base. During the deeper drillings the longitudinal alternate thrusts of the drill parts are apparent. The first part of the operation at least involves much the same sort of a motion as one employs in making a hole with a gimlet or awl.[1]

[1] In addition to the twisting motion and the alternate thrusts of the stylets there is yet another. It is the expanding or spreading of the drill parts during the enlarging or reaming out of the hole.

It takes but a moment in the spongy water-soaked stem of a sedge to drive the instrument up to its base. Then, after a moment of apparent quiet, the ovipositor is lifted slightly and the egg is forced by a series of abdominal contractions down the ovipositor and into the cavity reamed out to receive it.

The egg when forced into the ovipositor distends it considerably as it passes through its channel and thus can be seen to slip down into position with its distal end directed forward beneath the insect. The ovipositor being at last withdrawn from beneath, the egg slips out from behind the exposed circular end of it.

A number of eggs may be imbedded thus, in the stem before the ovipositor is sheathed—each one requiring a separate puncture. In the cylindrical stems of plants procumbent upon the water the eggs are likely to be inserted on the sides as they come in contact with the surface film, but this is by no means necessarily the case.

As frequently as not the male accompanies the female during the process. Having mounted her in mating he merely moves forward and remains perched upon her back as she busies herself with egg laying, mating being attempted and often consummated between her labors. [1]

In starting the drill in a particularly stubborn or inconvenient place the female not infrequently uses one of her hind legs to steady and stiffen or support the drill. One female after making several attempts employed her right hind leg in such a manner that the tarsus was turned at an angle with the tibia and the angle thus formed used to direct and aid the ovipositor.

During the process of oviposition the female often defends herself from molestation by kicking vigorously with the hind legs when disturbed.

Description of Egg.

Size: Length .875 mm.; greatest diameter .187 mm. to .250 mm.; diameter of exposed circle .15 mm.

Shape: This shape is best shown in the drawing. The egg is elongate oval with a curved neck terminating in a flat surface which

[1] In mating the male mounts the female—clasps his fore legs around her mesothorax in front of her middle legs—rests his middle legs upon the water film or other supporting surface and holds the hind legs poised in the air. The copulatory organ of the male is long and curves around the side of the tip of the female's body to come into contact with the genital opening. Contact lasts from a few seconds to one minute or longer. Upon withdrawal the copulatory organ is seen to be a slender white tube of astonishing length.

marks the exposed end of the egg as it lies *in situ* in the stem of some plant.

Color: When first laid, white; in the course of two or three days it has become watery transparent with portions of the embryo beginning to take form. These eggs buried singly as indicated above are shown in the drawings (Pl. I, Figs. 5 and 7). The exposed end of the egg shows up as a shiny membranous circular spot on the surface of the plant which bears it and is visible to the naked eye. This spot, though clear white when first laid presents at about the second day a very faint ring of pink which darkens to a deep pink after twenty-four hours. In the course of another day or two this gradually fades and two days before hatching the deep red eye spots may be seen through clear stems in the position shown in Fig. 7.

The egg stage lasts seven to nine days. At hatching the young nymphs, still enclosed in their embryonic membrane, work their way up through the little circular openings of the stem. This is a remarkable feat considering the size of the nymph and the size of the hole but is aided materially by the peculiar backward pointed pegs on the thin embryonic membrane. When well out of the stem this membrane is cast and the nymph takes its place upon the water.

First Instar.

Size: See the table presented below.

Color: When first hatched it is white with red eyes darkening to amber and green as it ages. To the unaided eye it is greenish brown. Thus it is much darker than the older nymphs, quite distinct in coloring. The tips of the appendages are dark while the limbs themselves are pale.

Structural Peculiarities.—The general form is stouter and more robust than that of the later stages. The body and limbs are clothed with hairs and bristles as shown in the Fig. 4. The head and thorax bear a few stout bristles and the antennæ bear on the first segment several (usually 3 or 4) stout bristles directed mesally and the terminal segment is thickly covered with fine hairs. The limbs, besides bearing many hairs possess a number of black bristles arranged as follows: One stout bristle is prominent near the distal end on the anterior margin of the meso- and meta-thoracic

femura. The metathoracic tibia are beset with numerous irregularity arranged bristles. Terminating with one larger than the others.

The antennæ are stout and as long as the body, four segmented, the terminal segment is somewhat broadened and as long as the other three. The head bears no indication of ocelli but does possess the black bristles indicated in the later instars.

The limbs are stout, the tarsi one-segmented and ending in two claws.

The abdomen bears a dorsal pore on the median line of the dorsum of the fourth abdominal segment.

Later Instars.

The second and later instars are bright green in color and more slender in form. They possess relatively fewer hairs on the body—but retain the black bristles in the positions indicated in the first instar. There appear in these later instars one black bristle on anterior margin of fore femur and two on the other femora. The structural characters remain constant until the adult stage is reached when the following changes become apparent.

The first antennal segment possesses but one black bristle instead of a number of them (usually).

The limbs are more slender and tarsi 3-segmented.

The connexivium is broad and the sexual characteristics appear.

In the winged female there appear two dark ocelli-like spots on the vertex.

The winged forms are often found with membrane missing. They have been observed to break away this portion of the wing with the hind tibia, exposing the tip of the abdomen as shown in Fig. 1.[1]

Following is given a table of measurements of the various instars and of the adults:

[1] Mr. J. R. de la Torre Bueno describes this habit in Halobatinæ. Canadian Ent., Vol. IX, No. 1, p. 389 (1908)

TABLE OF MEASUREMENTS IN MILLIMETERS OF INSTARS OF MESOVELIA MULSANTI.

Stage.	Measurement from tip of femur to tip of femur.	Antennæ.				Hind leg.			Middle leg.			Fore leg.		
		1st seg.	2d seg.	3d seg.	4th seg.	Femur.	Tibia.	Tarsi.	Femur.	Tibia.	Tarsi.	Femur.	Tibia.	Tarsi.
1st instar....	1.	.149	.099	.11	.416	.416	.573	.211	.336	.306	.166	.25	.213	.129
2d "	1.25	.20	.125	.20	.5	.54	.625	.225	.35	.343	.188	.312	.26	.135
3d "	1.5	.25	.166	.207	.54	.625	.85	.275	.437	.44	.225	.375	.33	.167
4th "	2.125	.29	.21	.32	.75	.81	1.	.375	.625	.625	.29	.5	.38	.25
5th "	2.5	.375	.29	.375	.81	1.03	1.37	.437	.75	.75	.375	.625	.50	.26
6th ♂.....	.....	.65	.416	.716	.96	1.35	1.56	.5	1.09	1.09	.416	.858	.75	.26
6th ♀.....	.....	.59	.39	.65	.79	1.56	1.95	.65	1.17	1.17	.52	.91	.78	.312

Before attaining the adult stage, the nymph passes through five nymphal instars spending from two to three days in each stage. Mating occurs and oviposition begins about the third day. One female emerged August 1, began to lay August 3 and died August 12, having laid 44 eggs an average of nearly 5 eggs per day. Some of the females in isolation laid an average of less than this, while one female under observation laid 18 eggs in 24 hours, a surprisingly large number, when we consider the size of egg and adult. The table presented on p. 82 is the history of one of a number of series, of isolation rearings, and indicates the variations in the duration of the different stages. The record of the many that died after isolation is omitted. It represents at least 90 per cent. of the total for mortality is very heavy under laboratory conditions. However, rearing in isolation and in close confinement is the only way to arrive at the number of molts and duration of instars. When a number are reared together the close resemblance of the instars and the variation in size within a given instar makes precise observation impossible. The writer has endeavored to determine diagnostic characters for the various instars. In the apterous forms he has found the spread from tip of femur to tip of femur the only fairly satisfactory determination (see table above). The developing winged forms beginning with the third instar are readily placed. (See Fig. 3 for the size of the wing pads in the 5th instar.)

MESOVELIA MULSANTI—A HISTORY OF A FEW ISOLATED REARINGS.

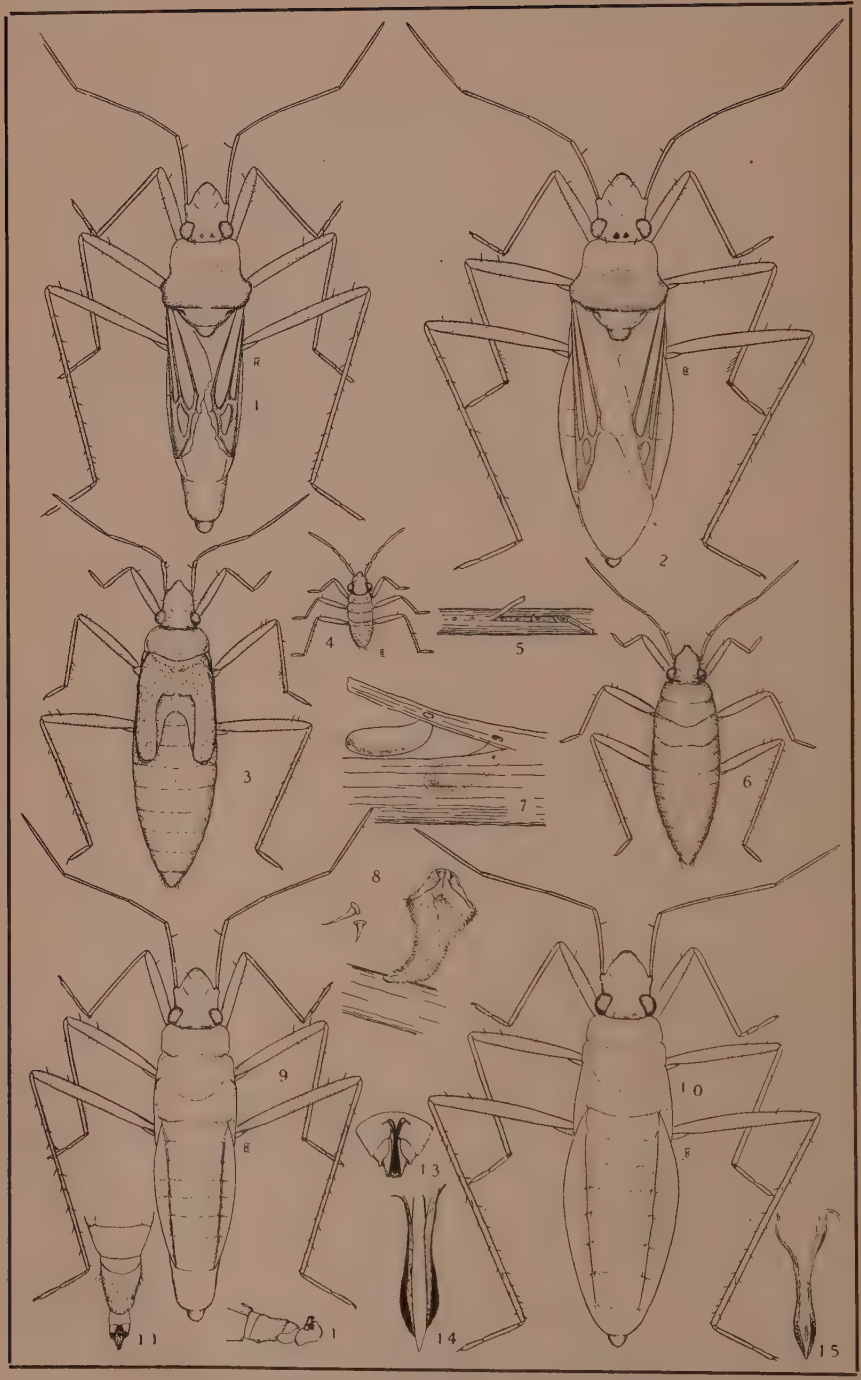
Exp. No.	Lot. No.	Egg laid.	Egg hatched.	1st molt.	2d molt.	3d molt.	4th molt.	5th molt.	Mated.	Eggs laid.	No. of eggs.	Died.
1685.....	1643	7/ 5/16	7/13/16	7/18/16	7/19/16	7/22/16	7/24/16	7/27/16	7/29/16	7/30/16	26	8/ 5/16
1643.....	1643	7/ 5/16	7/13/16	7/16/16	7/19/16	7/22/16	7/24/16	7/26/16	♂	.....	....	7/30/16
1688.....	1643	7/ 5/16	7/13/16	7/15/16	7/16/16	7/19/16	7/22/16	7/25/16	♀	7/28/16	15	8/ 2/16
16142.....	1657	7/13/16	7/21/16	7/23/16	7/25/16	7/27/16	7/29/16	8/ 1/16	♀	8/ 4/16	21	8/ 9/16
16x.....	....	7/24/16	8/–1/16	8/ 3/16	8/ 6/16	8/ 8/16	8/11/16	8/14/16	♂	.....	....	8/22/16
16y.....	....	7/13/16	7/21/16	7/23/16	7/25/16	7/27/16	7/29/16	8/ 1/16	♂	.....	....	8/ 7/16
1657.....	1657	7/13/16	7/19/16	7/21/16	7/23/16	7/26/16	7/29/16	7/31/16	♀	.....	....	7/31/16
16571.....	1657	7/13/16	7/20/16	7/22/16	7/24/16	7/26/16	7/29/16	8/ 1/16	8/ 4/16	8/ 9/16	10	8/ 6/16
16197.....	....	7/13/16	7/20/16	7/22/16	7/25/16	7/27/16	7/29/16	8/ 1/16	8/ 3/16	8/ 4/16	44	8/12/16

Summary.

Mesovelia mulsanti is found about the margins of ponds and pools upon floating vegetation where it feeds upon small organisms coming to the surface film from below or that fall upon it. The species probably passes the winter as adults that begin ovipositing in the spring. They place their eggs in the stems of plants and even in the spongy wood of floating logs.[1] There is a succession of generations throughout the season, each cycle requiring about twenty-four days. Winged and wingless forms occur together. Besides flying from pool to pool, they may be transferred in the egg stage. Mr. Beamer sent them from the southern part of the state to the writer at Lawrence, Kans., in the stems of sedge used as packing for some Naucorids.

The general distribution of this species, and the ease with which it may be controlled and observed both as to oviposition and to hatching, make it a valuable object for studies on these phases of animal behavior.

[1] Since this paper was submitted for publication the writer has learned from Mr. J. R. de la Torre Bueno that he found the eggs of these bugs in plants some years ago. This gives him priority of observation on this point.



HUNGERFORD—Life-History of *Mesovelia mulsanti*.

Explanation of Plate.

Fig. 1. Mesovelia mulsanti, winged male with membrane of wings broken off.

Fig. 2. Mesovelia mulsanti, winged female, wings entire.

Fig. 3. Fifth instar nymph; note the dorsal pore on fourth abdominal segment.

Fig. 4. First instar nymph.

Fig. 5. Eggs in stem of sedge, surface view of the two at left. The other two seen in situ in stem when portion of stem is removed.

Fig. 6. Fourth instar apterous form.

Fig. 7. Two eggs, showing their connection with surface of stem; eye spot shows in the one to the right.

Fig. 8. The embryonic membrane, cast by the hatching nymph; 2 "pegs" shown at the left enlarged.

Fig. 9. Apterous male.

Fig. 10. Apterous female.

Fig. 11. Male genitalia from above.

Fig. 12. Male genitalia from side, hooks in black.

Fig. 13. Ventral view of female ovipositor in its sheath.

Fig. 14. Ovipositor, lateral shafts shaded. They slide up and down on the central shaft.

Fig. 15. Cephalic view of ovipositor, turned into position for action.

Drawings 1, 2, 4, 9, and 10, by Miss Ellen Edmonson.

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NOTES ON APHIDS.

By G. O. Shinji,
Berkeley, California.

Nectarosiphum rubicola Oestl., with description of the male.

Alate viviparous female. General color, pale or green. Length of body, 3.8 mm. Width of abdomen, 1.6 mm. Wing expansion, 4.3 mm. Head, pale or green, broader than long, width between the eyes, .45 mm. Beak, reaching second coxa, near the tip dusky. Antenna situated on frontal tubercle, pale except dusky rings at the distal end of III, IV and V, VI including spur dusky, length of articles: III, 1.1 mm.; IV, .7 mm.; V, .55 mm.; VI, .3 mm.; spur, 8 mm. Sensoria about 14 on III, one each on IV and V. Prothorax wider than long, width, .6 mm., pale. Mesothorax slightly dusky, border with muscle lobes amber, width, 1 mm. Metathorax slightly dusky. Legs, distal one fifth the length of tibia and entire tarsi dusky, rest pale. Abdomen, pale, inflated. Cornicles mostly dusky, often basal half pale, length, 1 mm. Cauda, pale. Wings hyaline with smoky area near the tips of forewings, expansion: forewing, 4.9 mm., hind wing, 2.7 mm.

Apterous viviparous female. General color, pale or green. Length of body, 2.7 mm. Width of abdomen, 13 mm. Head, pale, broader than long. Beak reaches to third coxa, pale except apical half of third joint which is dusky. Length of antennal joint: III, .9 mm.; IV, .6 mm.; V, .55 mm.; VI, .2 mm.; spur, 1 mm. Prothorax, pale. Thorax and abdomen, pale. Tibia dusky. Rest of legs color of the body. Cornicle, dark, slightly swollen

as in alate form, 1.2 mm. long. Cauda, pale, longer than wide at base.

Host plant: Thimbleberry.

Locality: University of California campus, Berkeley, Calif.

Date of collection: March 20, 1915.

Male (alate): Alate, wing venation as in the alate viviparous female. General color, rosy. Body small, length, 1.6 mm., width of abdomen, .5 mm. Head black or at least dusky, broader than long, length, .3 mm. between the eyes. Rostrum beyond the third coxa. Eyes black, large. Antenna black except lighter base of III. Length of joints, III, 1.1 mm.; IV, .8 mm.; V, .7 mm.; VI, .3 mm.; spur, 1.2 mm. Sensoria on antennal joints distributed as follows: III, 5; IV, 15; V, 15. Cornicles, black, .6 mm. long. Style dusky, small. Mesathorax black, length, .5 mm. Metathorax, black. Abdomen cylindrical, not much inflated, rosy or light red.

Anteroventrally to the cauda there is a pair of somewhat horny cerci.

Host plant: Thimbleberry (*Rubus parviflorus* Nutt.).

Locality: University of California campus, Berkeley, Calif.

Date of collection: April 4, 1915.

Notes.—So far as my knowledge goes, *N. rubi* is one of the earliest male producers, the other being *Myzus ribis*. Although I have never studied the life history of this particular species, I had the opportunity of observing the emergence of stem-mothers from their eggs about the twentieth of February. The males were found only on the underside of already tinged leaves, while parthenogenetic forms were infesting terminal shoots and green, tender leaves. Not a single specimen of oviparous female or of egg could be found on the same or nearby plants at the time when males were abundant. Although the male of this species can be distinguished from its sisters by smaller size, darker coloration, numerous antennal sensoria, presence of paired cerci, etc., the only character common to the males of all Aphids, it must be mentioned, is the presence of cerci. To illustrate, the males of *Aphis pomi* are alate, and lighter than the alate viviparous form. The males of *Rhopalosiphum lactucae* are as large as the alate viviparous females. Again, the males of *Calaphis betuloecolens* have the same number of antennal sensoria as the alate sisters.

Chaitophorus coleoptis sp. nov.

Alate viviparous female. Body small, length including cauda, 1.4 mm. Width of abdomen, .7 mm. Wing expansion, 2.3 mm. Head broader than long, slightly narrower than prothorax, width including eyes, .45 mm., dusky. Beak reaching to second coxa, tip dusky. Antenna arising from side of head, six articled, third joint subequal to spur, apical half of fifth together with sixth including filament dusky, rest the color of the body. Length of articles: III, .4 mm.; IV, .23 mm.; V, .2 mm.; VI, .1 mm.; filament, .4 mm. Eyes dark red. Prothorax dusky, very short, width, .47 mm. Mesothorax dusky, width, .65 mm. Metathorax dusky. Front leg pale except tarsi which is dusky, middle and hind legs of the color of body with femora and tarsi dusky. Length of femora: front, .25 mm.; middle, .35 mm.; hind, .45 mm. Length of tibia: front, .35 mm.; middle, .50 mm.; hind, .75 mm. Abdomen, pale with a large middle dorsal patch of dusky or several transverse dusky bands, and also marginal dusky patch, somewhat hairy. Cornicles pale, constricted about the middle, slightly longer than wide at base. Style dusky, rounded at tip and constricted at base, provided with long spines. Anal plate pale, apex nearly straight, but a little curved in, never rounded nor much indented. Wings small, usually normal in venation, often one of the two varies in venation but cases in which both right and left wings are abnormal is rare.

Apterous viviparous female. Body with spines, pale, small, length, 1.45 mm. Width of abdomen, .9 mm. Head the color of body. Eyes dark red. Antenna arising from side of head; sixth including spur and apical half of fifth dusky, the rest color of head, length of articles: III, .4 mm.; IV, .23 mm.; V, .2 mm.; VI, .1 mm.; spur, .4 mm. Thorax and abdomen compressed, hairy, pale. Legs pale, except dusky tarsal joints. Cornicles pale, shape as in alate form, style, with spines, pale, anal plate as in alate.

Host plant: Abies balsami.

Locality: San Francisco.

Date of collection: April 10, 1915.

AN INTERESTING MANUSCRIPT.

By L. O. Howard.

At a meeting of the Biological Society of Washington, held March 10, 1917, Dr. Hugh M. Smith, chief of the United States Bureau of Fisheries, exhibited a packet of 283 loose sheets, each sixteen and five-tenths centimeters by ten centimeters, backed by pasteboard covers and labeled in manuscript, "Olivier's North American Coleoptera, 283 plates." Below this legend is dimly written in pencil by a different hand, "Painted by Mrs. C. L. H.—, wife of Professor C. L. Hentz, bgt. November 2, 185—." Dr. Smith, after exhibiting the packet, presented it to the writer, calling attention to a newspaper clipping which he had found under the cover from the *Boston Transcript* of November 21, 1856, giving a notice of the death of Prof. N. M. Hentz at the residence of his son, Dr. Charles A. Hentz, at Mariana, Fla., on the fifth instant (*i. e.*, November, 1856), followed by a brief obituary notice. Dr. Smith further stated that this packet had been bought by his father at a book sale very many years ago.

On careful examination it seems obvious that this collection of loose leaves constitutes a selection of all the North American species of Coleoptera from the six volumes of A. G. Olivier's "Entomologie, ou Histoire Naturelle des Insectes Coleopteres." Obtaining access to a copy of Olivier's great work, Prof. Nicholas Marcellus Hentz had evidently asked his talented wife, Caroline Lee Hentz, to copy the colored illustrations and descriptions of all of the species described from North America. Or possibly he did the drawing and she copied the descriptions.

Hentz, before his marriage, had lived at Boston and Philadelphia, moving south shortly after marriage in 1824. Olivier's work may have been loaned to him from Philadelphia or from Boston, as he was frequently in correspondence with T. W. Harris.

In the correspondence, as published in "The Entomological Correspondence of Thaddeus William Harris, M. D.," printed by the Boston Society of Natural History, in 1896, there is no reference to the loan of Olivier, but the last letter published was Harris to Hentz, November 6, 1839, and the manuscript copy was probably made later than that date.

On comparison of these loose leaves with the copy of Oliver in the Library of the Bureau of Entomology the Hentz illustrations prove to be very faithful copies, a little lighter in color as a rule, but with the added effort in some cases of indicating high lights on dark species, which improved their general appearance as compared with the copy of the printed work in Washington. In a few cases the colors are not completely worked in.

In the copies of the descriptions useless words are omitted. For example, should the original read, "Les antennes sont noires," Mrs. Hentz would simply write "Antennes noires." But no useful descriptive word is omitted. The enormous amount of copying that Harris, Fitch and other early entomologists had to do in the absence of funds for the purchase of rare works is a matter of frequent record. It is doubtful, however, if there exists a more perfect and useful manuscript than the one just described. It will be extremely useful, even today, since it brings together in compact form only the North American species described and figured by Olivier. It will be deposited either in the Library of the United States National Museum or in that of the Bureau of Entomology, where it may be consulted.

THE NORTH AMERICAN SPECIES OF *PACHYNEUR ON* WITH THREE NEW SPECIES (CHALCID-FLIES).

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

Based on the types (except *albutius*). Females.

I. Legs yellow except the coxæ (compare *anthomyiæ*).
Scapeblackish. (Is a *Dibrachys*.)
nigrocyaneum Norton
Scape yellow. As in *anthomyiæ* (of which it is a probable variant). Median carina of propodeum sometimes single (the abdominal petiole not strongly striate). (=*syrphi* Ashmead) (=*syrphicola* Ashmead.).....*albutius* Walker

II. Legs with at least the coxæ and femora concolorous or the latter darkened. Spiracular sulcus narrow, distinct, no

lateral carina. Mandibles 4=dentate. Clypeal projection with a tooth on each side of its base.

Abdominal petiole over twice longer than wide, scaly. Neck of propodeum conspicuous; clypeus with its projection with a concave distal margin. Coxæ and femora submetallic. Scape yellow. Median carina of propodeum obsolete . . . . . *altiscuta* Howard

Abdominal petiole only a little longer than wide. Clypeal projection truncate or subtruncate.

Coxæ metallic, femora washed with metallic.

Scape pale.

Propodeum with a more or less complete (paired and diverging) median carina which is somewhat like a ruga and rather delicate, variable. Funicle joints all short, somewhat variable. Abdominal petiole scaly. (=*allograptæ* Ashm.)

anthomyiæ Howard

The same. Propodeum with single median and lateral carinæ, the latter more or less obscure and paired at base; petiole with strong longitudinal striæ. Scutellum with a distinct cross-suture before apex. Segment 2 of abdomen caudad at meson faintly emarginate . . . . *hammari* Crawford

The same but scutellum without a distinct cross-suture before apex (only a faint obscure ridge in its place as in other species), segment 2 of abdomen is sharply minutely incised caudad at meson (as in the other species), the spiracular sulcus is twice broader while the median and lateral carinæ of the propodeum are more delicate

virginicum sp. nov.

Scape with the distal half metallic.

The same as *hammari* but the cross-suture of the scutellum is indicated by coarser punctures, distad of its site, the caudal margin of segment 2 of the abdomen is convex, entire, the median carina of the propodeum is represented by several interlacing, delicate rugæ broadly across the meson while

the tibiæ are dark except at each end or reddish brown.....*texanum* sp. nov.

Scape wholly metallic except at the extreme base of its body; the bulla metallic.

Propodeum as in *Propachyneuronia siphonophoræ* Ashmead (plane with a neck and spiracular sulcus). Scutellum with no indication of a cross-suture; segment 2 of abdomen slightly emarginate at meson caudad, convex there. Petiole subquadrate, finely scaly. Funicle 1 somewhat the smallest.....*californicum* sp. nov.

Pachyneuron virginicum Girault.

Female: Like *hammeri* Crawford except as pointed out above. The male is the same except that the funicle joints are considerably longer, 1 twice longer than wide.

From a pair reared from wingless, viviparous females of *Aphis sorbi* Kaltenbach on apple. Blacksburg, Virginia, August, 1915 (M. T. Smulyan).

Types: Catalogue No. 20368, U. S. N. M., the pair on tags, the male head and caudal tibia on a slide.

Pachyneuron texanum Girault.

The types are three females reared at College Station, Texas, in February, 1891, from wheat (F. M. Webster). Catalogue No. 20369, U. S. N. M., the examples on tags, a head and a caudal tibia on a slide.

Pachyneuron californicum Girault.

The males have the legs white except the coxæ and the proximal half of the caudal femur; the scape is nearly wholly whitish, the funicle more hairy, with joints 1–2 subequal and over twice longer than wide. The types and cotypes are three pairs on tags with a slide bearing a female head and caudal leg. Mt. Antonio, Calif., 6,000 feet, July 20, 1911, and Carpenteria, Calif., August 17, 1911 (P. H. Timberlake). Catalogue No. 20370, U. S. N. M., two pairs on tags (Mt. Antonio) and the slide.

NEW MISCELLANEOUS CHALCID-FLIES FROM NORTH AMERICA.

By A. A. Girault.
Bureau of Entomology, Washington, D. C.

Pseudiglyphomyia marilandica sp. nov.

Female: Length, 1.00 mm. Very similar to *nigrivariegata* Girault but somewhat smaller and differing also in the following particulars: The general color is orange; the face of prothorax has a black stripe across it; cephalic margin of scutum rather broadly black; the parapsidal furrows and the suture between scutum and scutellum are more noticeably black; also black thus—there is a moderately large round spot in the center of the scutellum; the spot on the axillæ is more distinct; the cephalic margin of the propodeum narrowly out a little laterad of the spiracle and an oblique stripe from base between meson and spiracle, extending well toward apex; and seven narrow cross-stripes on dorsal abdomen from base to apex, the first broadly interrupted at the meson. Prothorax lemon yellow. Tegulæ dusky, also the antennæ, the scape paler except on dorsal edge and toward the apex. Mandibles 6-dentate. Funicle joints subequal, each twice longer than wide and longer than the pedicel; club 1 nearly as long as funicle 1, longest, 3 with a distinct terminal spicule. The propodeum is as in *nigrivariegata* but there is no very narrow lateral carina directly from the minute round spiracle which is not very close to the cephalic margin. Types compared.

One female, open woods, Glenndale, Md. (September 28, 1916).

Type: Catalogue No. 20622, U. S. National Museum, the female on a tag, the head and the hind tibiæ on a slide.

Euplectrus platypenæ Howard.

Reared from a larva on grass, Barbados, B. W. I., January, 1915 (F. Watts).

Gonatocerus illinoiensis sp. nov.

Female: Similar to the description of *juvator* Perkins but the legs are yellow except all tibiæ and tarsi besides the prothorax, lateral and caudal margins of scutum and the parapsides except apex

(cephalad). Fore wings subhyaline. Middle and hind coxæ black. A most beautiful species when alive.

One female, window of a laundry, Coulterville, Ill., June 10, 1911.

Type: Catalogue No. 20631, U. S. National Museum, the female on a slide.

Neomphaloides cincinnatus sp. nov.

Female: Length, 1.20 mm. Slender, the stylus a little shorter than the ovipositor and a third of the abdomen's length.

Dark metallic blue, the wings hyaline, the venation and scape pale, the tarsi, knees, cephalic and middle tibiæ and the caudal legs except the coxæ golden yellow. Abdomen above and below with a large peltate spot of golden yellow at base (base and lateral margin narrowly concolorous, the yellow reaching to apex of basal third) and with over the basal half of the stylate part golden yellow. Pedicel but somewhat longer than wide, about half the length of funicle 1, the latter slightly longest, thrice or more longer than wide, the club joints twice longer than wide, the third with a distinct but not elongate terminal spine. Mandible tridentate, the third tooth obliquely truncate. Stylus hairy. Punctures along lateral margin of scutum very delicate, obscure. Sculpture usual but the propodeum rather coarsely scaly, with a narrow median carina and a similar, straight lateral one, the spiracle minute, round, halfway between middle and cephalic margin.

One female, woods, Glenndale, Md., September 9, 1916.

Type: Catalogue No. 20472, U. S. National Museum, the female on a tag, the head on a slide.

A second female, same place, some days later.

Dibrachys clisiocampæ (Fitch).

Four females reared from the larvæ of *Phthorimæa operculella*, Pasadena, Calif. (J. E. Graf).

Polynema bifasciatipenne (Girault) **varium** var. nov.

Female: Differing from the typical form in being light yellowish brown, including the legs; distal stripe of fore wing nearly as long (or even longer) as the middle one and subrectangular, its apical margin flatly convexed, its basal nearly straight. Ovipositor black except at base, more extruded (for a length equal to a third

of that of the abdomen's body or nearly as long as the slenderer petiole). And the hind wings are wholly hyaline.

The male has a fuscous band across the abdomen a little before apex.

One male, three females described in detail in Journ. New York Ent. Soc., December, 1910, pp. 254–258. Locality, *Fredonia*, Kans.; eggs of *Œcanthus*.

Types: Catalogue No. 20599, U. S. National Museum, one male, three females on tags.

Anaphoidea conotracheli (Girault).

From eggs of *Craponius inæqualis*, West Virginia (F. E. Brooks).

Eutelus betulæ sp. nov.

Female: Length, 1.00 mm. Dark metallic green, the wings hyaline, the scape, most of the pedicel, venation, cephalic tibiæ, tips of other tibiæ and the tarsi, yellowish brown. Body finely scaly punctate, the propodeum and abdomen scaly, the former tricarinate but the median carina weak, subobsolete. Parapsidal furrows incomplete. Propodeal spiracle minute, rounded, its own diameter from the cephalic margin. No spiracular sulcus. Abdomen conic-ovate, a little longer than the rest of the body, depressed or sunken above, its second segment occupying a fourth of the surface. Lateral ocelli far distant from the eyes. Clypeus small, not advanced, sharply incised at the meson, thus bidentate, its teeth obtuse. Mandibles 3- and 4-dentate. Antennæ inserted near the clypeus, a little below the ventral ends of the eyes, 13-jointed with three ring-joints, the third of the latter largest; funicle joints subquadrate, subequal, somewhat shorter than the pedicel. Stigmal vein a half shorter than the marginal, somewhat shorter than the postmarginal.

The male is similar but the abdomen is much shorter, depressed and obtuse at apex.

From two pairs reared from "*Cecidomyiia betulæ*, Albany, N. Y., June 10, 1887 (J. A. Lintner)."

Types: Catalogue No. 20789, U. S. National Museum, two pairs on tags, appendages on a slide.

Eutelus salicis sp. nov.

Female: Length, 2.15 mm. Like the preceding but much larger, the pedicel is entirely reddish yellow and larger (also the first two ring-joints; funicle 1 is about twice longer than wide), the femora reddish yellow; the clypeus is not incised but broadly sinuate or concaved; the abdomen is longer and stylate, not sunken, the antennæ inserted barely below the ventral ends of the eyes; the propodeum is about as in *Habrocytus onerati* and the marginal vein is somewhat larger. Differs from *H. onerati* (Fitch) mostly in that the flagellum is black, the antennæ with three ring-joints and somewhat lower on the face.

From three females reared from a conical Cecidomyid gall on *Salix longifolia*, Melrose, Mass., January 20, 1882 (U. S. Department Agriculture).

Types: Catalogue No. 20788, U. S. National Museum, the three females, minutien-mounted and a slide bearing caudal tibiæ and a head.

Achrysocharella pulchrella sp. nov.

Female: Length, 1.00 mm. Bright orange yellow, the abdomen somewhat paler, the wings hyaline, the body marked with dark metallic blue as follows: Pronotum, cephalic half of scutum, a dot on each side, center of occiput, a tolerably broad stripe across the base of the abdomen, followed immediately by a narrow cross-stripe and then at intervals equal to the basal stripe (except in the first instance) by four sometimes thicker cross-stripes, the last one of which is at base of distal third. Legs, scape and pedicel, white, the funicle and club dusky. Tip of ovipositor valves black. Head and thorax very finely punctate, the propodeum and abdomen scaly. Propodeum plane, with a median carina and a oblique carina just laterad of the rounded spiracle. Scutellum with a seta on each side of the middle, somewhat flattened. Postmarginal vein shorter than the stigmal. Terminal spine of the club as long as its joint; pedicel, funicles 1–2 and club 1 subequal, twice longer than wide; club 2 somewhat shorter, 3 still shorter. Club narrowing distad. Mandibles with two acute outer teeth and a third inner which is rather broadly truncate at apex and there with minute teeth. Parapsidal furrows barely indicated cephalad. Habitus of the Australia *grandis*.

From one female in the U. S. National Museum Collection from the District of Columbia.

Type: Catalogue No. 20438, U. S. National Museum, the female on a card, the head on a slide.

Atoposomoidea ogimæ Howard. Genotype.

Same as *Diaulinopsis* but postmarginal abbreviated. Head normal.

Grotiusomyia flavicornis sp. nov.

Female: Length, 1.20 mm. Aeneus black, the wings hyaline, the legs (except the coxæ and femora) and the antennæ, straw yellow. Pedicel dusky. Head and thorax finely scaly punctate, the abdomen scaly except segment 2 which is glabrous (except at apex). Postscutellum and propodeum subglabrous, the latter with a strong median carina and a curved smooth sulcus in the site of the lateral carina, the mesal margin of which is an obtuse carina; spiracle elliptical, of moderate size, cephalad. Parapsidal furrows complete, fine like lines. Pronotum transverse-quadrate, over half the length of the scutum. Segment 2 of abdomen much the largest, occupying a third of the surface, its caudal margin straight. Axillæ considerably advanced. Marginal vein as long as the submarginal, over twice the length of the long stigmal, the latter distinctly shorter than the postmarginal. Mandibles 6=and 7=dentate. Club 2=jointed, nippleless, the joints about equal in length, 1 a little wider than long. Pedicel somewhat longer than wide, the funicle joints shortening and widening, 1 slightly shorter than the pedicel, the others wider than long. Antennæ clavate. Femora usually yellow except the caudal ones.

From six females reared from an oak pyralid, Washington, D. C.

Types: Catalogue No. 20695, U. S. National Museum, the females on tags (1 minutien), a head and four caudal legs on a slide.

Aphidencyrtus aspidioti Girault.

A pair from *Lepidosaphes ulmi*, Monmouth, Me., July 22, 1914 (E. H. Siegler). The male bears two ring-like funicle joints and a very long, solid club, the antennæ 5=jointed.

Lamprostatus canadensis sp. nov.

Female: Length, 2.45 mm. Stout. Dark metallic green, the wings hyaline, the venation dusky yellow, the tibiæ and tarsi reddish brown. Head and thorax densely scaly, the scutellum with a deep, foveate cross-suture before its apex and at base with a short median sulcus and row of small punctures along its lateral margin; propodeum with a median carina (and no others) from which run more or less distinct oblique rugæ; also a lateral carina distad only, the spiracle moderately large, ovate. Petiole wider than long, the second abdominal segment occupying not quite half of the surface, its caudal margin straight but with a short slit at the meson. Antennæ inserted a little below the middle of the face, above the ventral ends of the eyes; clypeus not advanced but at each end with a stout tooth and another in the middle (of its ventral margin); an obtuse ridge from the clypeus to the antennæ along the meson. Parapsidal furrows deep, distinct. Suture between pronotum and scutum distinct. Antennae 13=jointed with two ring-joints, the club wider than the funicle but not half its length; funicle 1 a third longer than wide, 6 quadrate, longer than the pedicel. Scape not long. Postmarginal vein longer than the marginal, the stigmal long, a little shorter than the marginal. Abdomen flat above, much keeled beneath, smaller than the thorax. Mandibles 3=and 4=dentate.

Described from one female in the U. S. National Museum from Banff Springs, Alberta, Can. (E. A. Schwarz).

Type: Catalogue No. 20429, U. S. National Museum, the specimens on a tag, the head, caudal legs and a fore wing on a slide.

Miscogaster flora sp. nov.

Female: Length, 2.10 mm. Like *abnormicolor* but only the caudal tibiae are purple and the blotch on the fore wing does not form a crescent but is a large, oblique marking from the apex of the stigmal vein, its sharp end caudo-proximad; the clypeus is somewhat more produced. Funicle 5=jointed.

From two females, Jacksonville, Fla. (Ashmead).

Types: Catalogue No. 20790 U. S. National Museum, the specimens on tags, a head, fore wing and caudal tibiæ on a slide.

Miscogaster biguttata sp. nov.

Female: Length, 2.25 mm. Similar to *flora* but the legs all white, the fore wings bear two small, rounded spots, one at the apex of the stigmal vein, the other, larger and somewhat quadrate, at the base of the marginal vein. In some males, the proximal spot is absent and there is a narrow, yellow cross-stripe at about apex of proximal fourth. Antennæ nearly all yellow.

From five males, one female with *flora*.

Types: Catalogue No. 20791, U. S. National Museum, the specimens on tags.

Megorismus poloni sp. nov.

Female: A third smaller than *lasiopterœ* Ashmead and differing from that species notably in having the antennæ wholly concolorous except the bulla; also, as follows: the antennæ are inserted somewhat farther ventrad, on a level with the ventral ends of the eyes; the clypeus is stoutly bidentate at the apical meson instead of unidentate, as in the other species; the propodeum is subglabrous and though tricarinate there is not a cross-carina consisting of three rugæ which converge at the meson from each side. Segment 2 of abdomen occupying nearly a half of the surface; its caudal margin at meson with a short slit. Lateral carina of propodeum failing just before the cephalic margin. Postmarginal vein more or less subequal to the marginal, longer than the slender stigmal. Prothorax distinct. Parapsidal furrows complete, shallow. Scutellum with a shallow cross-suture before the apex. Petiole of abdomen quadrate, reticulate, the abdomen conic-ovate, pointed ventrad, about as long as the thorax. Antennæ 13-jointed with two ring-joints; funicle 1 a little longer than wide, much shorter than the subelongate pedicel; funicles 2–4 subequal to 1, 6 quadrate. Scape long and slender. Tibiæ at each end yellowish brown. Mandibles 4-dentate.

Described from four females from Placer County, California, August (U. S. National Museum).

Types: Catalogue No. 20792, U. S. National Museum, the specimens, minutien-mounted and a slide bearing a head and caudal tibiæ.

In the species *lasiopterœ*, segment 2 of the abdomen is shorter than in *poloni* and its caudal margin is entire.

Trydymus æneicornis sp. nov.

Female: Half the size of *robiniæcola* Ashmead and differing farther in having the antennæ wholly metallic green and also the legs except knees, tips of tibiæ and tarsi; otherwise the same but the spiracle of the propodeum is smaller and about its own diameter from the cephalic margin. The clypeus at apex is distinctly convexly projected. Valves of ovipositor distinctly shortly extruded. First ring-joint extremely short. Pedicel longer than the subquadrate funicle 1. Otherwise as in the named species.

Described from one female taken from a plum tree in New York State, May 25, 1888.

Type: Catalogue No. 20425, U. S. National Museum, the female on a tag and a slide.

Trydymus gargantua sp. nov.

Female: Length, 2.30 mm. Like *æneicornis* but very much larger, a third or more larger than *americensis* or *robiniæcola* and differing farther as follows: the scape is yellow at extreme base, the pedicel at apex and beneath, the funicle and club all so except above; the legs are golden yellow except the coxæ and the proximal two thirds (less on cephalic femur) of the femur which are metallic; the ovipositor is not at all extruded and the propodeal spiracle is large, oval and at cephalic margin. Pedicel subequal to funicle 1. The same otherwise.

The male is similar but the funicle is 6-jointed, the club 2-jointed, funicle 1 shorter.

Described from a pair from Ithaca, N. Y. (Cornell University).

Types: Catalogue No. 20426, U. S. National Museum, the pair on tags, male and female antenna and caudal legs on a slide.

The clypeal projection is somewhat more prominent in this species.

Trydymus poloni sp. nov.

Female: Like *gargantua* but the ovipositor is a little extruded, the legs are golden yellow except most of the middle and all of the caudal coxæ, the antennæ so except the scape above at distal two thirds, the pedicel above and the funicle joints too, more or less; the projection of the clypeus is not convex but subtruncate; the foveæ along the cephalic margin of the propodeum are minute and

the spiracle is oval and a short distance off the cephalic margin. The same otherwise. Mandibles 4-dentate.

Described from one female on a tag in the U. S. National Museum from Franconia, N. H.

Type: Catalogue No. 20427, U. S. National Museum, the female on a tag, a caudal leg and the head on a slide.

A NEW SPECIES OF THE GENUS *MYMAR* FROM THE WOODS OF MARYLAND WITH AN IMPORTANT DESCRIPTIVE NOTE.

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

Mymar cincinnati sp. nov.

Male: Similar to *venustum* (female type) but the antennæ are entirely black, the base of the blade of the fore wing is rather broadly infuscated, there are on the fore wing 43 primary marginal cilia (instead of 34), the midlongitudinal line of discal cilia runs from apex nearly to the base of the blade (instead of into the costal margin, farther from base); and most of the discal cilia of the fore wing are *caudad* of the midlongitudinal line instead of *cephalad* as in the other species. Scape long, curved; flagellar joints elongate, subequal, 2 eight times (or more) longer than wide.

One male captured by sweeping grass in an open wooded bog, Glenndale, Md., August.

Type: Catalogue No. 20468, U. S. National Museum, the specimen on a slide.

Mymar venustum has the caudal wing shaped like a long thick bristle with the hooklets at its apex. In the above new species it is similar but prolonged beyond the hooklets in the form of a hair as long as the part from base to the hooklets and after that length widening into a very linear blade of more than half the length of the hairlike pedicel and which bears a few long marginal cilia caudad. In *Mymar*, then, the hind wing has a short, very linear blade on a long pedicel while the petiole of the wing (from base to hooklets) is much longer than in the other genera. This blade part of the wing must break off easily and this accounts for

its absence in *venustum*. In the Australian *M. tyndalli*, the blade-like portion of the caudal wing was absent. *Neomymar* has normal hind wings except that the petiole is long as in *Mymar*.

A METALLIC SPECIES OF *CIRROSPILOPSIS* FROM MARYLAND (HYMENOPTERA EULOPHIDÆ).

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

The following species resembles a *Diaulinopsis* but there are no grooves on the scutellum, the caudal tibial spur is single and the club without a distinct apical nipple.

Cirrospilopsis metallicus sp. nov.

Female: Length, 1.10 mm. Brassy metallic green, the wings hyaline, the legs (except the coxæ; apex of first coxæ yellow), venation and the antennæ (except the scape and pedicel except both at apex), golden yellow. Body densely scaly, the parapsidal furrows distinct, the propodeum moderately short, nonearinate (a median carina subobsolete), the spiracles small, rounded, cephalad. Bristles on thorax minute, sparse. Postscutellum rather large. Mandibles 4-dentate, the last two teeth much smaller than the others. Pedicel subequal to funicle 1 which is nearly twice longer than wide, 2 somewhat shorter, the club somewhat longer than the funicle; ring-joints distinct. Middle tibial spur long, slender. Stigmal vein not quite half the length of the marginal, the postmarginal two-thirds the length of the marginal.

From two females captured by sweeping in the woods, Glenndale, Md., May 4, 1916.

Types: Catalogue No. 20291, U. S. National Museum, the specimens on a tag, a head and two caudal tibiæ on a slide.

A NEW SPECIES OF *CLOSTEROCERUS* FROM CALIFORNIA (HYMENOPTERA EULOPHIDÆ).

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

This new species is characterized by bearing narrow fore wings with rather long apical fringes and a T on the fore wing formed by a long longitudinal stripe from proximad and the first cross-stripe; the letter is on its side, to the right from the upright.

Closterocerus tau sp. nov.

Female: Length, 0.85 mm. Black metallic blue, the scutum and scutellum lighter blue except marginally, the tarsi white except the distal joint; pronotum conical, light blue discally. Body densely scaly, the propodeum with a median carina only, subglabrous. Venation sooty, the very long marginal vein silvery white. Fore wing broadening distad, about thrice longer than wide at its truncate apex, its apical marginal cilia somewhat less than half the greatest width, the discal ciliation absent except on the infuscations; the thick longitudinal stripe originates at caudal margin opposite the base of the marginal vein and runs straight into the middle of the first cross-stripe which is across from the apex of the marginal and all of the post marginal veins (with the stigmal in its middle); first cross-stripe somewhat narrower than the second which is at apex, the hyaline space between them equal to the second cross-stripe. Stigmal and postmarginal veins subequal, not very short, the first at right angles to the marginal. Funicle joints equal, twice wider than long; pedicel very large, longer than the funicle. Mandibles tridentate. Otherwise usual. Wings with two cross-stripes.

From one female on a tag in the U. S. National Museum from Inyo County, California.

Type: Catalogue No. 20290 U. S. National Museum, the specimen above, the head and a fore wing on a slide.

A NEW GENUS OR SUBGENUS OF PACHYNEURINE CHALCID-FLIES.

By A. A. Girault,
Bureau of Entomology, Washington, D. C.

Propachyneuronia gen. nov.

Based on *Encyrtus siphonophoræ* (Ashmead) of which *Pachyneuron micans* Howard, *P. aphidivorum* Ashmead and *Pachyneuron maidiaphidis* Ashmead are synonyms (types examined). The same as *Pachyneuron* but the antennæ bear three ring-joints. The genotype has the clypeus radiate striate but not strongly, acutely produced (a smaller tooth on each side of the clypeus); the propodeum bears a neck and is plane (except for a few foveæ along the cephalic margin) with the spiracle small, its own diameter from the cephalic margin. Mandibles acutely 4-dentate. Scape metallic, the funicle joints all short. Abdominal petiole transverse, with a tooth from each side. Segment 2 of the abdomen entire as to its caudal margin, occupying about a third of the surface. Stigmal vein longer than the marginal.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. E. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

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Want to correspond with collectors of Noctindae in Northern Massachusetts. Subject to supply will pay any reasonable price for good specimens Catocola Sappho.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Old Series Entom., Bul. 1, 2, 3, 33; Technical Series 4, 6, 7; Insect Life, vol. 4–6; Jour. Applied Microscopy I, N. Y. State Entom. Rep. 3, 4; Fitch Rep. 7, 8, 13.—Philip Dowell, Port Richmond, N. Y.

Would appreciate receiving date, stage and mode of hibernation of insects of all orders. J. P. Baumberger, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Ill. Ent. Rpts. 2, 3, 5, 7. 9, 10, 11, 12, 13, 19; Hensham's List of the Coleoptera of America North of Mexico, 1895. For Exchange Bulletins and Circulars U. S. Bur. Ent.—J. S. Wade, Wellington, Kan.

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